Claims

[I] A three-dimensional (3D) photonic quantum ring (PQR) laser for a low power consumption display, wherein the PQR laser has a sufficient small radius to adjust an inter-mode spacing (IMS) of oscillation modes discretely multi-wavelength-oscillating in an envelope wavelength range within the gain profile of a given semiconductor material of the PQR laser so that the IMS has a maximal value.

[2] The 3D PQR laser according to claim 1, wherein the adjustment of the IMS to the maximal value causes the number of the oscillation modes oscillating in the envelope to be adjusted to a minimal value.

[3] The 3D PQR laser according to claim 2, wherein the radius of the PQR laser is in a range of 15D to 2 D depending on the structure and shape of the PQR laser and the semiconductor material.

[4] The 3D PQR laser according to claim 1, wherein the radius of the PQR laser is about 3D.

[5] The 3D PQR laser according to claim 3, wherein the number of the oscillation modes of the PQR laser is has a value of 1.

[6] The 3D PQR laser according to claim 4, wherein the number of the oscillation modes of the PQR laser has a value of 1.

[7] The 3D PQR laser according to claim 1, wherein the PQR laser oscillates in an oscillation wavelength band corresponding to one of red (R), green (G), and blue (B), to thereby emit corresponding colors therefrom.

[8] The 3D PQR laser according to claim 7, wherein the PQR laser, which oscillate in a wavelength band corresponding blue color, is coated with a material to generate a PQR spectrum having white color.

[9] A three-dimensional (3D) photonic quantum ring (PQR) laser for a low power consumption display, wherein the PQR laser has a sufficient small radius to adjust that the number of oscillation modes discretely multi-wavelength-oscillating in an envelope wavelength range within the gain profile of a given semiconductor material of the PQR laser has a value of 1.

[10] The 3D PQR laser according to claim 9, wherein the radius of the PQR laser is in a range of 15D to 2 D depending on the structure and shape of the PQR laser and the semiconductor material.

[II] The 3D PQR laser according to claim 9, wherein the radius of the PQR laser is about 3D.

[12] The 3D PQR laser according to claim 10, wherein the PQR laser oscillates in an oscillation wavelength band corresponding to one of red (R), green (G), and blue

(B), to thereby emit corresponding colors therefrom.

[13] The 3D PQR laser according to claim 12, wherein the PQR laser, which oscillates in an oscillation wavelength band corresponding blue (B), is coated with a material to generate a PQR spectrum having white color.